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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,686	12/27/2006	Jin Ho Choy	1751-405	4723
6449 7590 03/09/2009 ROTHWELL, FIGG, ERNST & MANBECK, P.C. 1425 K STREET, N.W. SUITE 800 WASHINGTON, DC 20005				
EXAMINER LEE, REBECCA Y				
ART UNIT 1793		PAPER NUMBER		
NOTIFICATION DATE 03/09/2009		DELIVERY MODE ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTO-PAT-Email@rfem.com

Office Action Summary

Application No.

10/595,686

Applicant(s)

CHOY ET AL.

Examiner

REBECCA LEE

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2 and 4-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-2, 4-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI/08)
Paper No(s)/Mail Date ____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

Status of Claims

Claim 3 is canceled. Claims 8-13 are newly added. Claims 1-2 and 4-13 are pending.

In view of the amendments made, the objection of claims is hereby withdrawn.

In view of the amendments made, previous rejections under 35 U.S.C. 102 and 103 are no longer applied. New grounds of rejection are made hereafter.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 9 and 12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are rejected under 35 U.S.C. 112, first paragraph as failing to comply with the description requirement thereof since the amended feature introduces new matter not supported by the original disclosure. The original disclosure does not reasonably convey to a designer of ordinary skill in the art that applicant was in possession of the design now claimed at the time the application was filed. See *In re*

Daniels, 144 F.3d 1452, 46 USPQ2d 1788 (Fed. Cir. 1998); *In re Rasmussen*, 650 F.2d 1212, 211 USPQ 323 (CCPA 1981).

Specifically, there is no support in the original disclosure for the phrases, "the absence of a citrate ion" in claim 9 and "the absence of hexamethylenetetramine" of claim 12.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 5 recites the limitation "the volume ratio of Zn acetate or its derivative".

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 6, 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tian et al. ("Biomimetic Arrays of Oriented helical ZnO nanorods and Columns", JACS, 2002, 124, 12954-12955) in view of Boyle et al. ("Novel low temperature solution

deposition of perpendicularly oriented rods of ZnO: substrate effects and evidence of the importance counter-ions in the control of crystal growth", Chem. Commun, 2002, 80-81).

Regarding claim 1, Tian et al. teaches a method of forming a ZnO nanorod array by first depositing ZnO nanoparticles on a substrate, and then the substrate is placed in a solution containing HMT and Zn nitrate to grow the ZnO nanorod arrays at 95°C (Column 1, lines 27-36), which indicates the ZnO nanoparticles served as both a buffer layer and a seed layer as claimed.

Tian et al. does not disclose the substrates recited in the claims.

Boyle et al. discloses nanophase ZnO would be grown on sapphire (Al_2O_3) substrate (Column 1, lines 15-21).

It would have been obvious to choose sapphire (Al_2O_3) substrate for growing ZnO nanorod arrays from a finite number of identified substrates (it would have been "obvious to try" the specific substrate to grow ZnO nanorod array and obtain the predictable result). In addition, this type of substrate is well known in the art to grow ZnO nanorods and the skilled artisan would have clearly appreciated that one can employ conventional substrates according to the Tian et al. in view of Boyle et al. absence evidence of criticality. Finally, the substitution of one type of substrate for another that is known to be used for the same purpose is clearly within the scope of the skilled artisan.

Regarding claim 4, Tian et al. discloses the nutrient solution contains 0.03M Zn nitrate and 0.1 HMT (Column 1, lines 33-36), which falls within the claimed volume ratio range.

Claim 6 is a product by process claim. The claimed nanorod array appears to be substantially identical with the one made by Tian et al. in view of Boyle et al., since the process of making is obvious over Tian et al. in view of Boyle et al. (MPEP 2113).

Regarding claims 8 and 10, Tian et al. discloses the nutrient solution contains Zn nitrate and HMT (Column 1, lines 33-36).

Regarding claim 9, Boyle et al. discloses oriented rods would be grown in zinc acetate and HMT (Column 2, lines 20-23). It is examiner's position that no citrate ion is present absent evidence to the contrary.

Claims 2, 5, 7, 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tian et al. ("Biomimetic Arrays of Oriented helical ZnO nanorods and Columns", JACS, 2002, 124, 12954-12955) in view of Boyle et al. ("Novel low temperature solution deposition of perpendicularly oriented rods of ZnO: substrate effects and evidence of the importance counter-ions in the control of crystal growth", Chem. Commun, 2002, 80-81) and Ren et al. (US7294417).

Regarding to claim 2, 11 and 13, Tian et al. teaches a method of forming a ZnO nanorod (array) by first depositing ZnO nanoparticles on substrate, then the substrate is placed in a solution containing zinc nitrate and sodium citrate to grow the ZnO nanorod

arrays at 95°C (Column 1, lines 27-36), which indicates the ZnO nanoparticles serve both as a buffer layer and a seed layer as claimed.

Tian et al. does not disclose the substrates recited in the claims.

Boyle et al. discloses nanophase ZnO would be grown on sapphire (Al_2O_3) substrate (Column 1, lines 15-21).

It would have been obvious to choose sapphire (Al_2O_3) substrate for growing ZnO nanorod arrays from a finite number of identified substrates (it would have been "obvious to try" the specific substrate to grow ZnO nanorod array and obtain the predictable result). In addition, this type of substrate is well known in the art to grow ZnO nanorods and the skilled artisan would have clearly appreciated that one can employ conventional substrates according to the Tian et al. in view of Boyle et al. absence evidence of criticality. Finally, the substitution of one type of substrate for another that is known to be used for the same purpose is clearly within the scope of the skilled artisan.

Tian et al. does not specifically teach the nutrient solution would contain zinc acetate as claimed instead of zinc nitrate.

Boyle et al. discloses ZnO nanorods would be grown from zinc acetate.

It would have been obvious to one of ordinary skill in the art to use zinc acetate in the process taught by Tian et al. since Boyle et al. teaches that the best result would be obtained from solution containing zinc acetate (Column 2, lines 20-23).

Tian et al. does not specifically teach the method would be used to synthesize a nanowall array.

Ren et al. teaches methods to synthesize ZnO of varied nanostructure morphologies on a substrate, like nanowall and nanorod (Column 2, lines 24-32 and 52-

59). It is examiner's position that nanowall and nanorods are obvious variations

Deleted: nanorods

absence evidence to the contrary. One of ordinary skill in the art would have appreciated either form of ZnO nanostructure base on industrial needs and applicability.

Regarding to claim 5, the combined references do not specifically teach the volume ratio of Zn acetate to sodium citrate is 10:1 to 1:10.

Since sodium citrate could control the growth behavior of the crystal. Citrate ions could specifically adsorb (002) surface and force the crystal to grow into plates (Tian et al. column 1, lines 8-13). It could have been obvious to one of ordinary skill in the art at the time the invention was made to change or modify the volume ratio between zinc acetate to sodium citrate, since it had been held that discovering an optimum value or a result effective variable involved only routine skill in the art. (MPEP 2144).

Claim 7 is a product by process claim. The claimed nanowall array appears to be substantially identical with the one made by Tian et al. in view of Boyle et al. and Ren et al., since the process of making is obvious over Tian et al. in view of Boyle et al. and Ren et al. (MPEP 2113).

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tian et al. ("Biomimetic Arrays of Oriented helical ZnO nanorods and Columns", JACS, 2002, 124, 12954-12955) in view of Boyle et al. ("Novel low temperature solution deposition of perpendicularly oriented rods of ZnO: substrate effects and evidence of the importance counter-ions in the control of crystal growth", Chem. Commun, 2002, 80-81) and Ren et al. (US7294417) as applied to claim 2 above, and further in view of Pacholski et al. ("Self-Assembly of ZnO: From Nanodots to Nanorods", Angew. Chem. Int. Ed. 2002, 41(7), 1188-1191).

Deleted: Nanodots

The combined reference does not specifically teach the reaction would be carried out without HMT.

Pacholski et al. discloses oriented ZnO nanorods would be formed from zinc acetate without the presence of HMT (Experimental section).

It would have been obvious to one of ordinary skill in the art to perform the process taught by Tian et al. in view of Boyle et al. and Ren et al. without adding HMT into the nutrient solution as disclosed by Pacholski et al. with reasonable expectation of success. One would be motivated to do so to increase economic efficiency.

Response to Arguments

Applicant's arguments filed January 21st, 2009 have been fully considered but they are not persuasive. Applicant argues Tian et al. teaches the use of two nutrient solutions instead of one as claimed. The argument is not persuasive.

The first solution Tian et al. use, which contains Zn nitrate and HMT, is used to deposit ZnO nanoparticles on the substrate (Column 1, lines 27-31), and then ZnO nanorods are grown on it; that is, the ZnO nanoparticles serve both as buffer layer and a seed layer. That reads on the claimed step of "coating on a substrate ZnO nanoparticles serving both as a buffer layer and a seed layer". In another words, the first solution Tian et al. used is not a "nutrient solution", but a coating solution, the second solution Tian et al. used, which contains sodium nitrate, HMT and sodium citrate, is the only nutrient solution for the growth of ZnO nanorod.

Applicant's remaining arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REBECCA LEE whose telephone number is (571)270-5856. The examiner can normally be reached on Monday-Friday 8:00 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JOHN SHEEHAN can be reached on (571)272-1249. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. L./
Examiner, Art Unit 1793

/John P. Sheehan/
Primary Examiner, Art Unit 1793